



**Unione Astrofili Napoletani**  
**INAF – Osservatorio Astronomico di Capodimonte**

# Ripristino e aggiornamento della ruota portafiltri

# Perchè utilizzare una ruota portafiltri?

Per ottenere le migliori fotografie dell'Universo, solitamente usiamo camere CCD monocromatiche, in quanto molto più sensibile della corrispondente a colori,

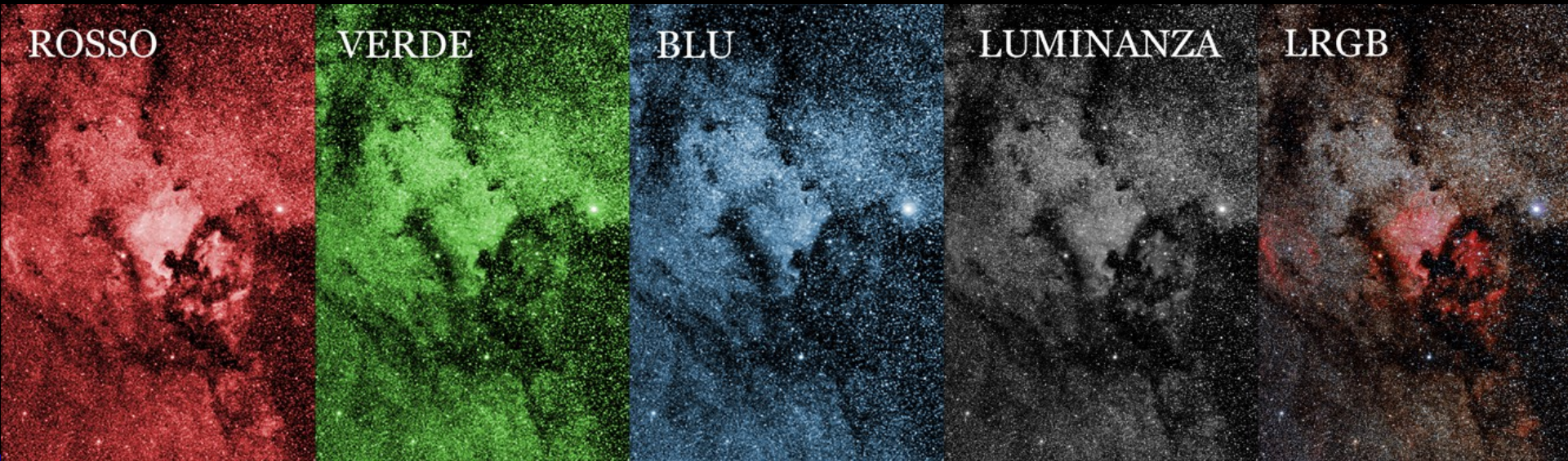
Per ottenere immagini a colori sarà necessario cambiare spesso filtri ad esempio per ricostruire immagini a colori (usando i Set LRGB) o per utilizzare filtri a banda stretta (come H-alfa, O-III o S-II).

Principali campi di utilizzo:

- Astrofotografia
- Fotometria
- Spettroscopia



# Tecnica LRGB



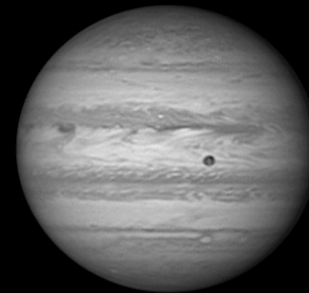
LRGB



RGB



R



# Stato prima dell'intervento

- Elettronica non operativa
- Piste di connessione saltate e integrati bruciati
- Necessità di PC con lettore floppy e porta parallela



# Interventi necessari

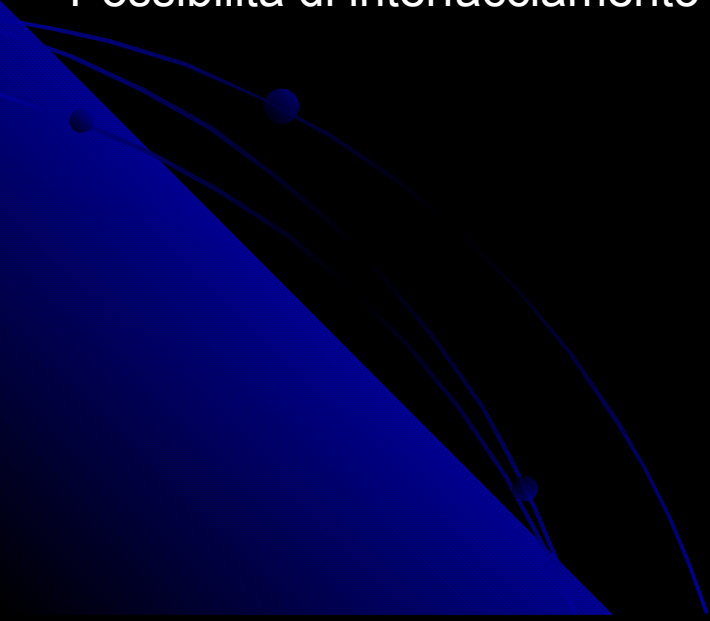
## ***Aggiornamento dell'elettronica:***

Rimessa in opera e personalizzazione delle funzioni(sistema open)

## ***Update funzionalità:***

Possibilità di utilizzare la ruota senza l'ausilio del PC (Stand-alone)

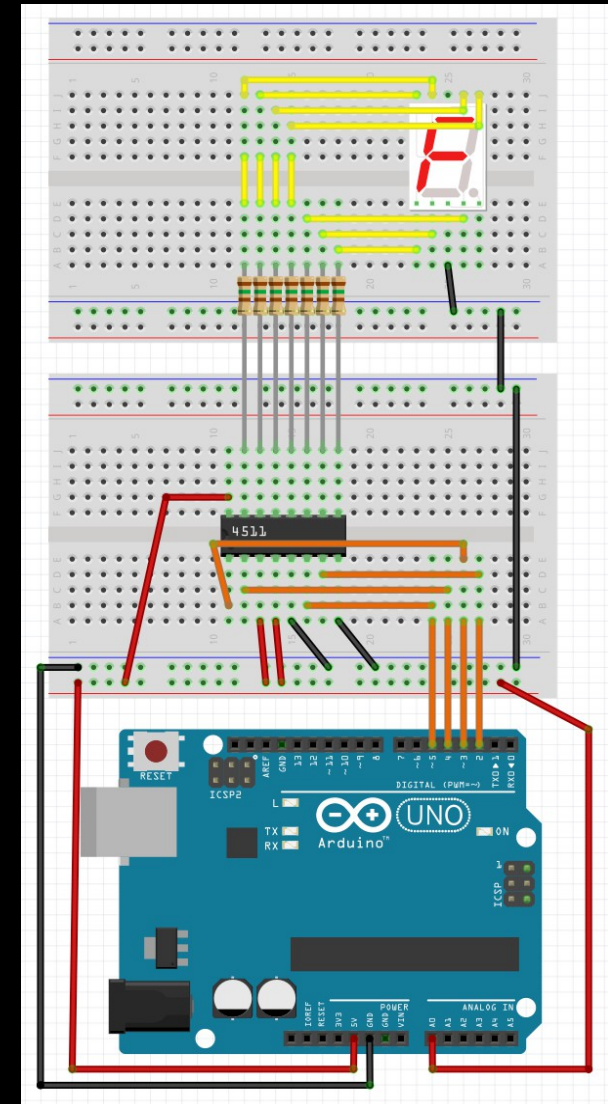
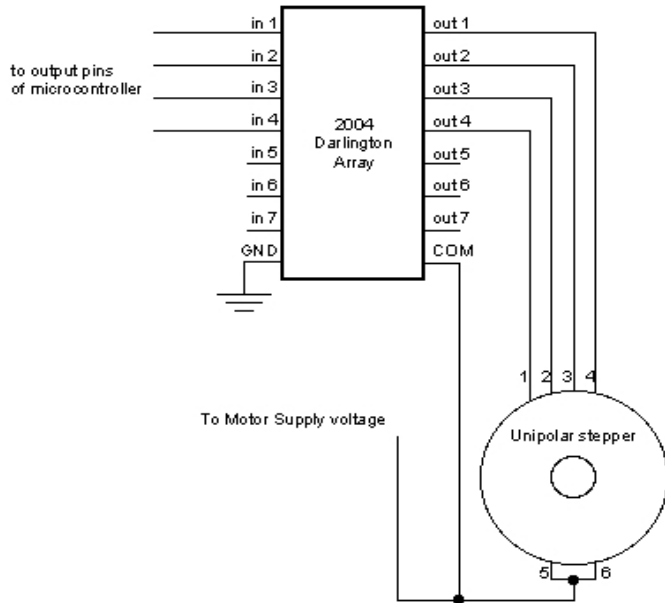
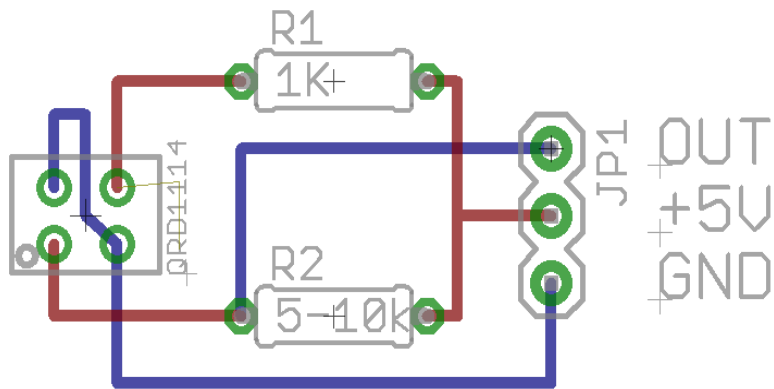
Possibilità di interfacciamento tramite driver Ascom



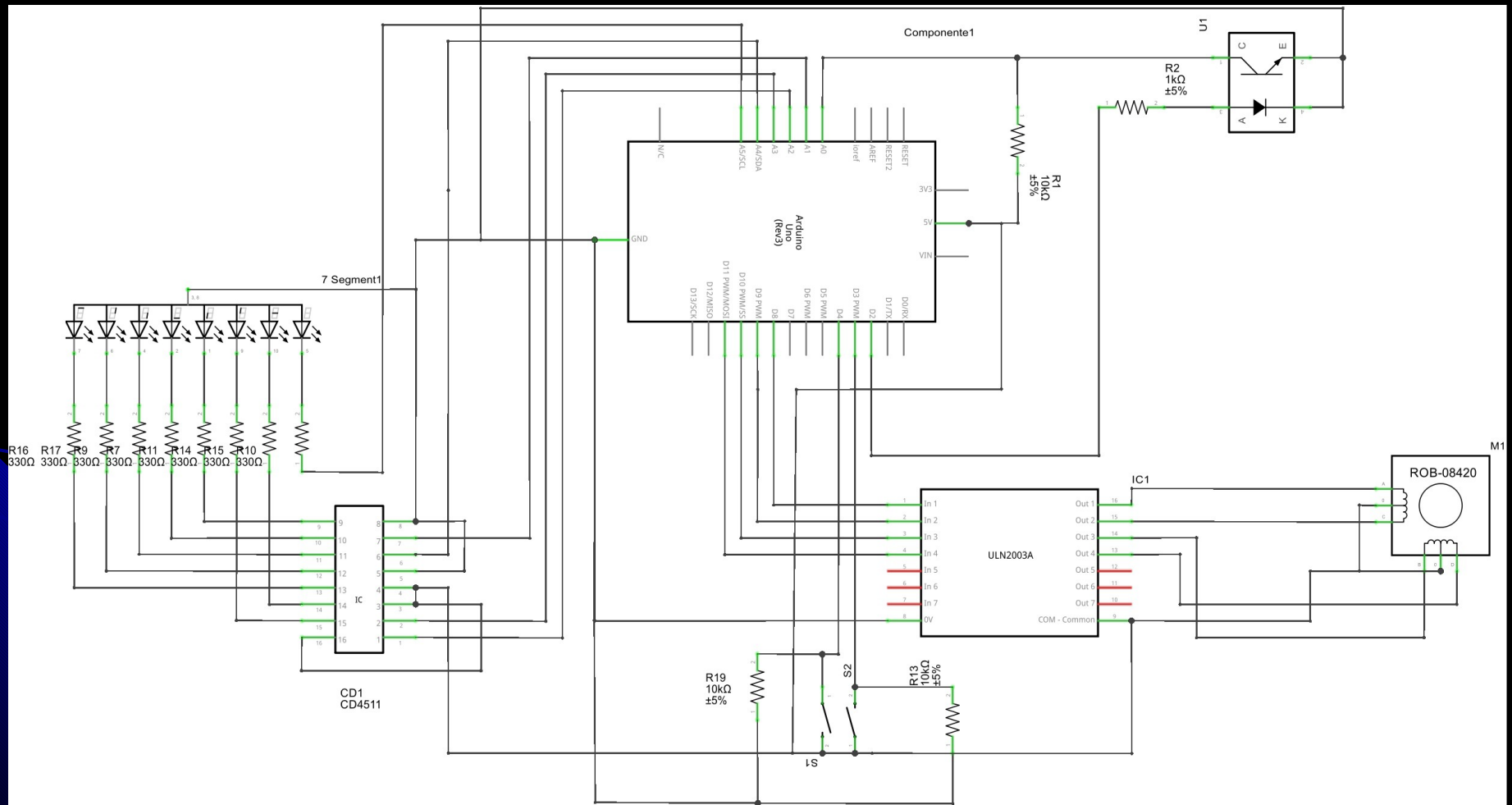
# Materiale e costi

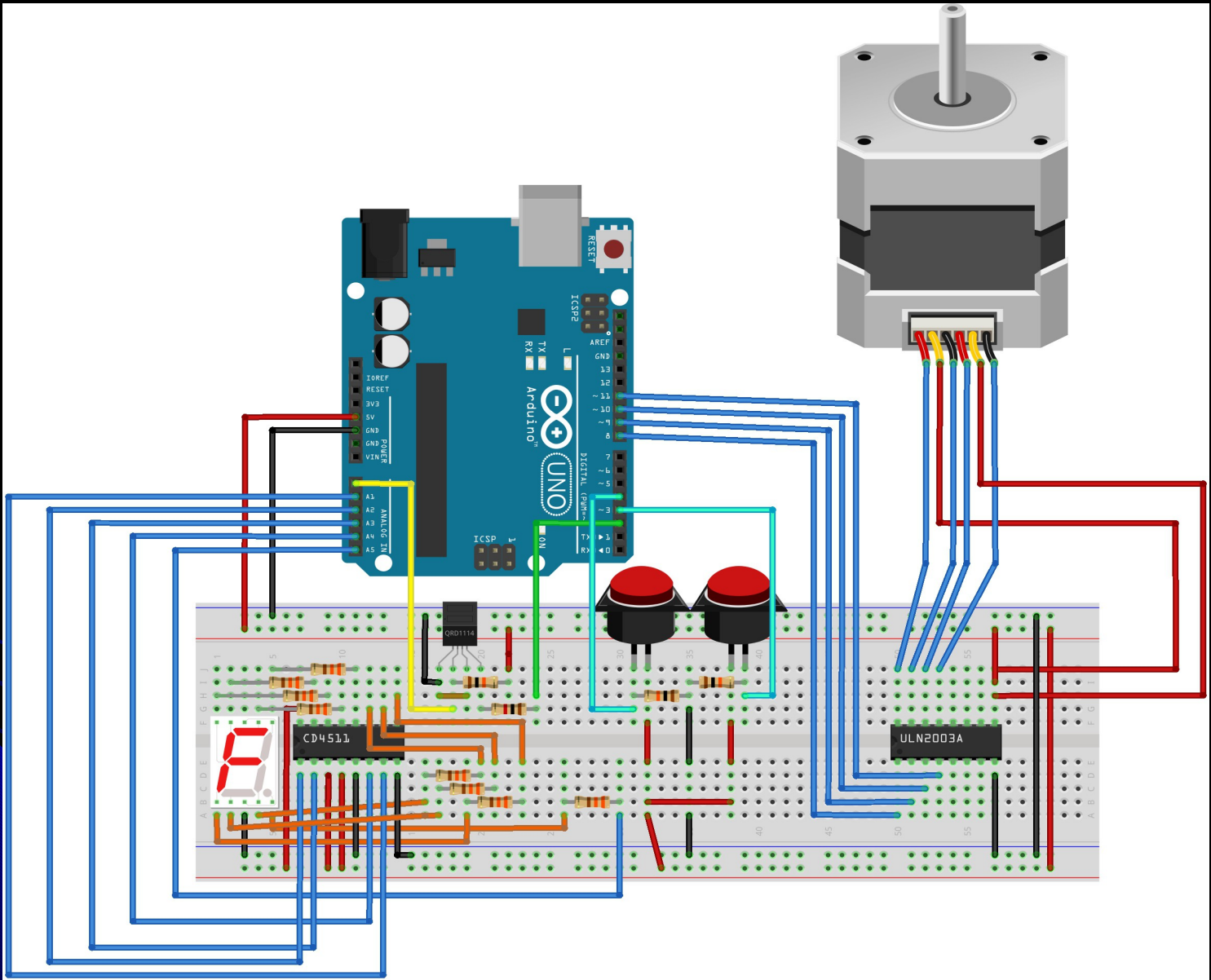
• Arduino Uno R3	23,06 €
• ULN2003	1,53€
• 10 led rossi	1,01€
• Sensore qrd1114	1,68€
• Kit500 resistenze	5,33€
• Display a 7 segmenti rosso	0,81€
• Integrato CD4511	1 €
• Contenitore Arduino	7,08€
• 2 pulsanti da pannello	1,81€
• s.s.	6,90€
<b>TOTALE</b>	<b><u>52,62€</u></b>

# Componenti principali

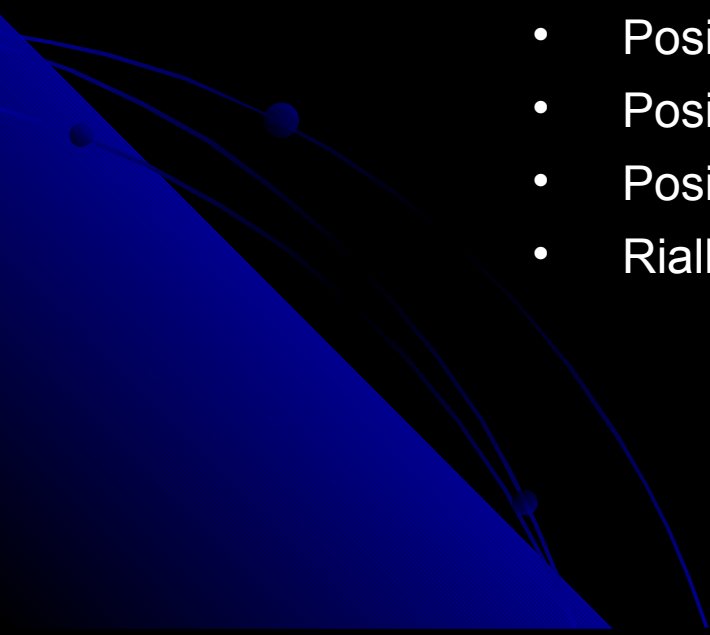


# Circuito Finale





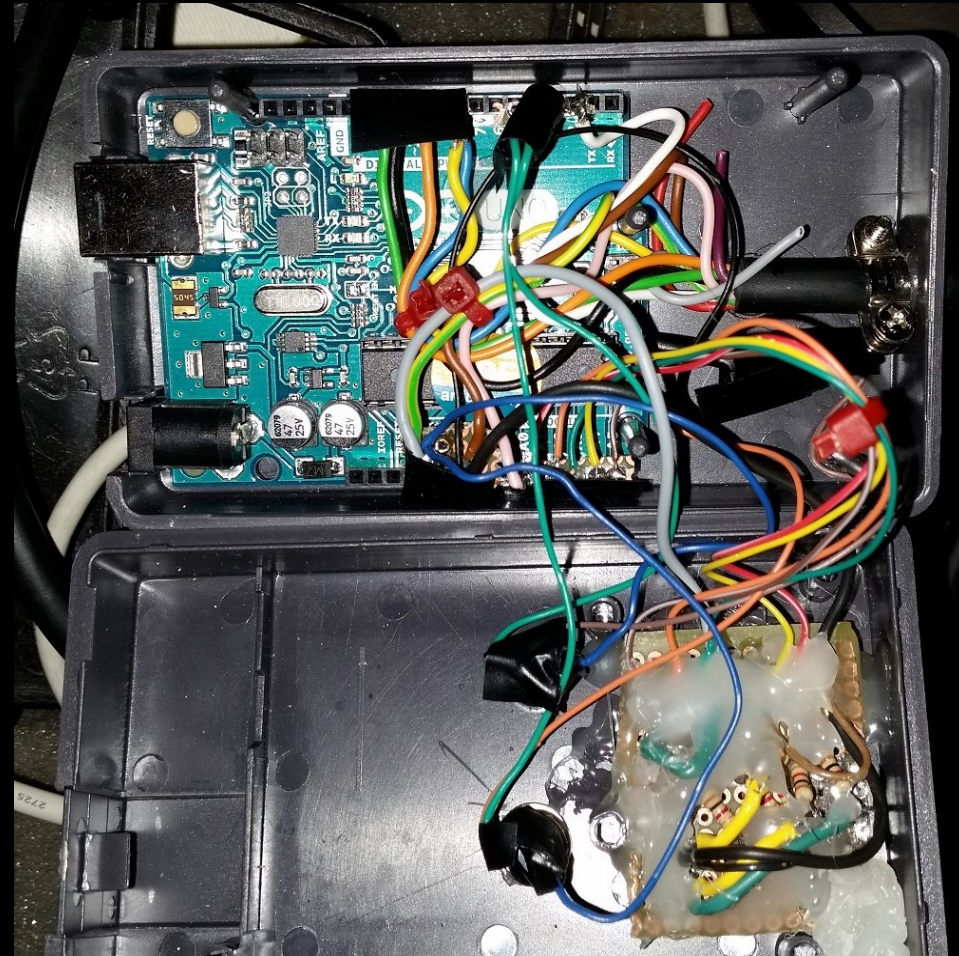
La ruota opera queste fasi:

1. Accensione e allineamento
  2. Posizionamento al primo filtro
  3. Attesa delle altre possibili operazioni:
    - Posizionamento al prossimo filtro
    - Posizionamento al filtro precedente
    - Posizionamento a un filtro di posizione arbitraria
    - Riallineamento
- 

# Stesura del firmware

```
stepper_oneRevolution | Arduino 1.6.0
File Modifica Sketch Strumenti Aiuto
stepper_oneRevolution
1
2 #include <Stepper.h>
3
4
5 int currentFlt=0;//when 0 it is not calibrated
6 int slcFlt=0; //indica il filtro selezionato
7 int absPst=0; //posizione assoluta in step ruota ==0 when flt=1
8
9
10
11 int ledPin=2; //infrared led
12 int sensorValue;
13 float voltage;
14 const int stepsPerRevolution = 48; // change this to fit the number of steps per revolution /
15 int Rbtn = 3; // bottone destro
16 int Lbtn = 4; // bottone sinistro
17
18 //initialize display
19 const int ina = A1; // Sets Digital pin 2 as ina (Input A on the 4511)
20 const int inb = A2; // Sets Digital pin 3 as inb (Input B on the 4511)
21 const int inc = A3; // Sets Digital pin 4 as inc (Input C on the 4511)
22 const int ind = A4; // Sets Digital pin 5 as ind (Input D on the 4511)
23 const int punto = A5; // Sets Digital pin 5 as ind (Input D on the 4511)
24
25 // initialize the stepper library on pins 8 through 11:
26 Stepper myStepper(stepsPerRevolution, 8,9, 10, 11);
27
28
29
30 void setup() {
31   pinMode(ledPin, OUTPUT);
32   pinMode(l3, OUTPUT);
33   pinMode(ina, OUTPUT); // Next four lines are setting the Arduino
34   pinMode(inb, OUTPUT); // up for digital output from ina to ind
35   pinMode(inc, OUTPUT);
36   pinMode(ind, OUTPUT);
37   pinMode(punto, OUTPUT);
38
39   pinMode(Rbtn, INPUT);
40   pinMode(Lbtn, INPUT);
41   // set the speed at 60 rpm:
42   myStepper.setSpeed(40);
43   // initialize the serial port:
44   Serial.begin(9600);
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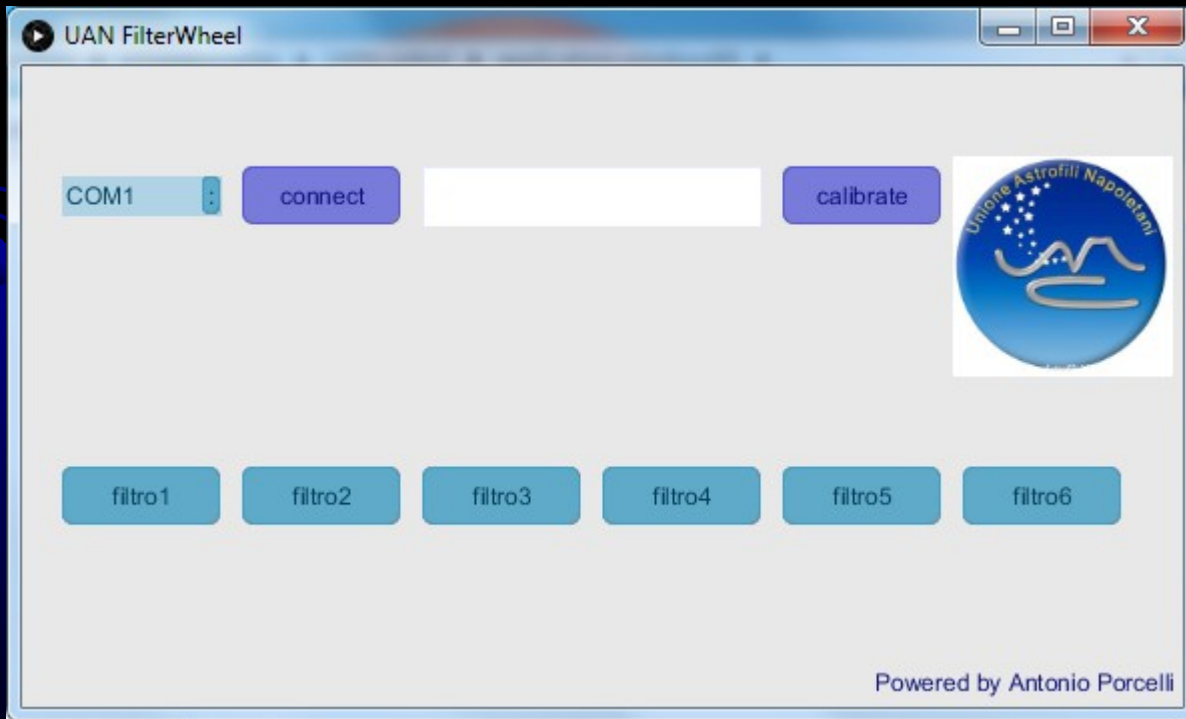
# Stato dopo l'intervento



# Sviluppo Sw Stand-Alone

Installare java runtime environment Vers.7 o superiore

Disponibile per Windows, MacOSX, Linux e Solaris



# Sviluppo Driver Ascom



Sequence Generator Pro - Trial Version (45 days remaining)

File View Sequence Tools Window Help

Histograms

Image Histogram

Auto Stretch  Lock Range

Stretched Histogram

B: 0 W: 65536

Histograms Image Statistics

PHD Graph

RA-Dec 100 Clear

Connect Gear Disconnect Gear

PHD Graph Frame and Focus

Untitled\*

Target List

- Target Set 1

Target Data

Selected: **Target Set 1**

Running: **None**

Directory:  Browse...

File Name:  Key

Equipment

Camera: No Camera

Filter Wheel: UANFilterWheel FilterWheel

Focuser: No Filter Wheel  
Filter Wheel Simulator [.Net]  
FLI USB Filter Wheel  
Manual Filter Wheel  
QSI Internal Filter Wheel  
SBIG Filter Wheel  
Simulator

Telescope:

Delay and Ord

Delay first:   Rotate through events

Delay between:   Finish entire events first

Sequence Status

Remaining time: 00:00:00

Elapsed time: 00:00:00

Target Status

Total events complete: 0/1 Remaining time: 00:00:00

Total frames complete: 0/1

0%

Event	Run	Type	Filter	Suffix	Exposure	Bin	Repeat	Progress
1	<input checked="" type="checkbox"/>	Light	None		0.00	1x1	1	0/1
2	<input type="checkbox"/>	Light	None		0.00	1x1	1	0/1
3	<input type="checkbox"/>	Light	None		0.00	1x1	1	0/1
4	<input type="checkbox"/>	Light	None		0.00	1x1	1	0/1
5	<input type="checkbox"/>	Light	None		0.00	1x1	1	0/1

# Conclusioni

È stato ripristinato il funzionamento della ruota portafiltri

Sono state aggiunte nuove funzionalità :

- Porta usb
- Sw Dedicato
- Driver Ascom

L'operazione ha avuto come costo totale 52,62€

(il costo di una ruota portafiltri motorizzata mediamente è di 250€)